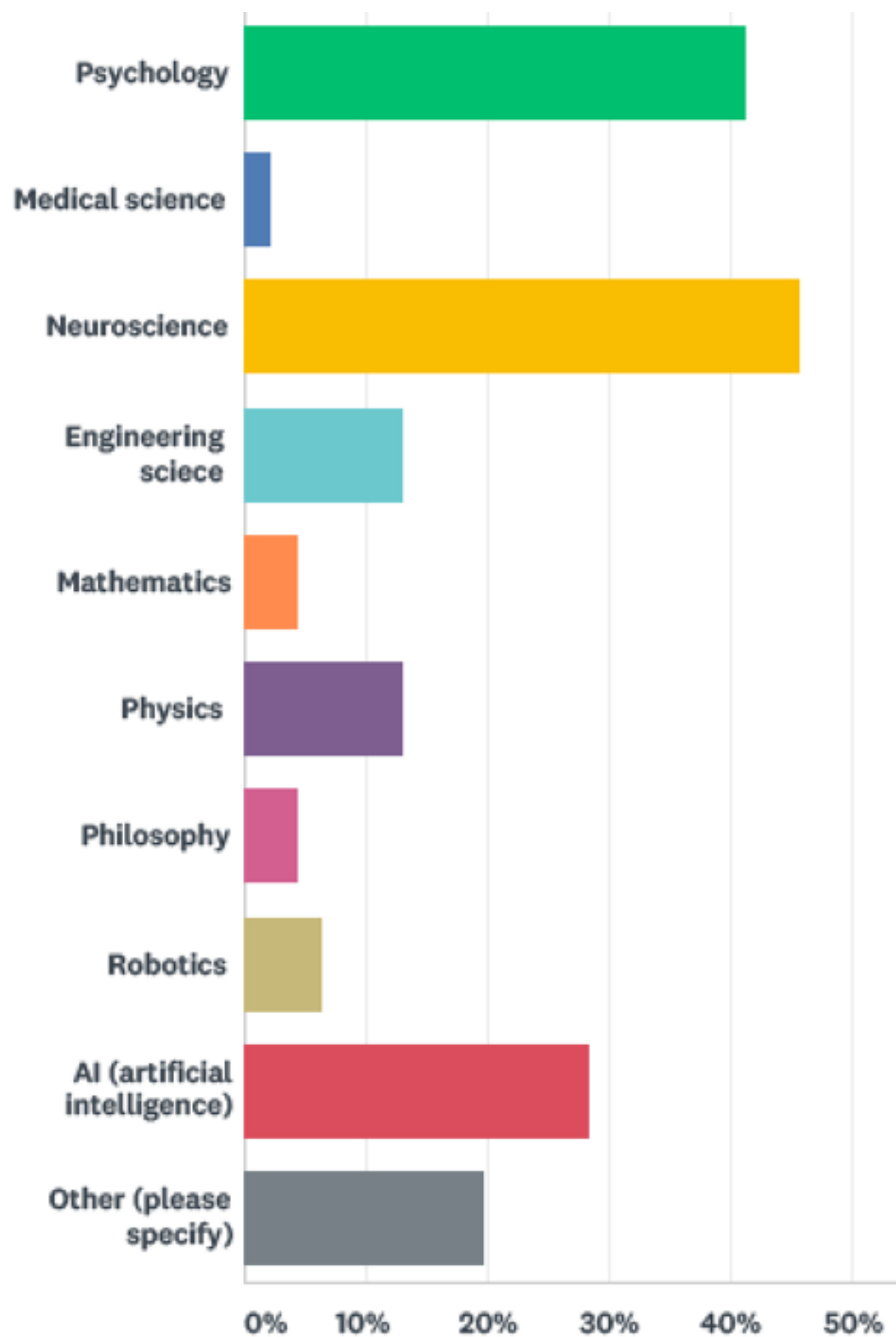


Introduction to:
Neuroscience of Consciousness
- Beyond NCC

2017 July 24
Nao Tsuchiya 土谷尚嗣
Monash University

About this satellite workshop

- Supposed to be a satellite workshop for Japan Neuroscience Society
- But, we **invited lots of non-neuroscientists** (AI, robotics, game planners, philosophers, engineers, mathematicians, physicists, clinicians, etc)
- Accordingly, we will NOT assume background knowledge in neuroscience. (Please ask clarification, quick questions anytime during the talk)



4 debates

- Intro
- Integrated Information Theory of consciousness
- Predictive coding
 - -> What are wrong about them as the theories of consciousness?
- Is self/language/body necessary for consciousness?
- Is there free will? Or not?

Goal

- Have fun!
- Novel perspectives, frameworks? New experiments?

Suggestions

- No dirty words, no personal attacks
- Let's focus on the debate in this room (if necessary, please use laptops, iPads, phones etc outside)
- This is quite important for this type of activity

Intro

- Why are we organizing this?
- Need for interdisciplinary and ground-breaking study approach towards consciousness
- Center for interdisciplinary studies of consciousness
- ISSA (Initiative for Synthesis of Studies of Awareness, 2015 & 2017)

A map of interdisciplinary studies of consciousness

Theoretical Philosophy

Experimental Psychology
 Psychophysics
 Humans

Application Clinical

Traditional  Emerging

A map of interdisciplinary studies of consciousness

Theoretical

Philosophy

Predictive coding

Integrated Information Theory

Experimental

Psychology

Neuroscience

Humans

Monkeys

Neural Network

Application

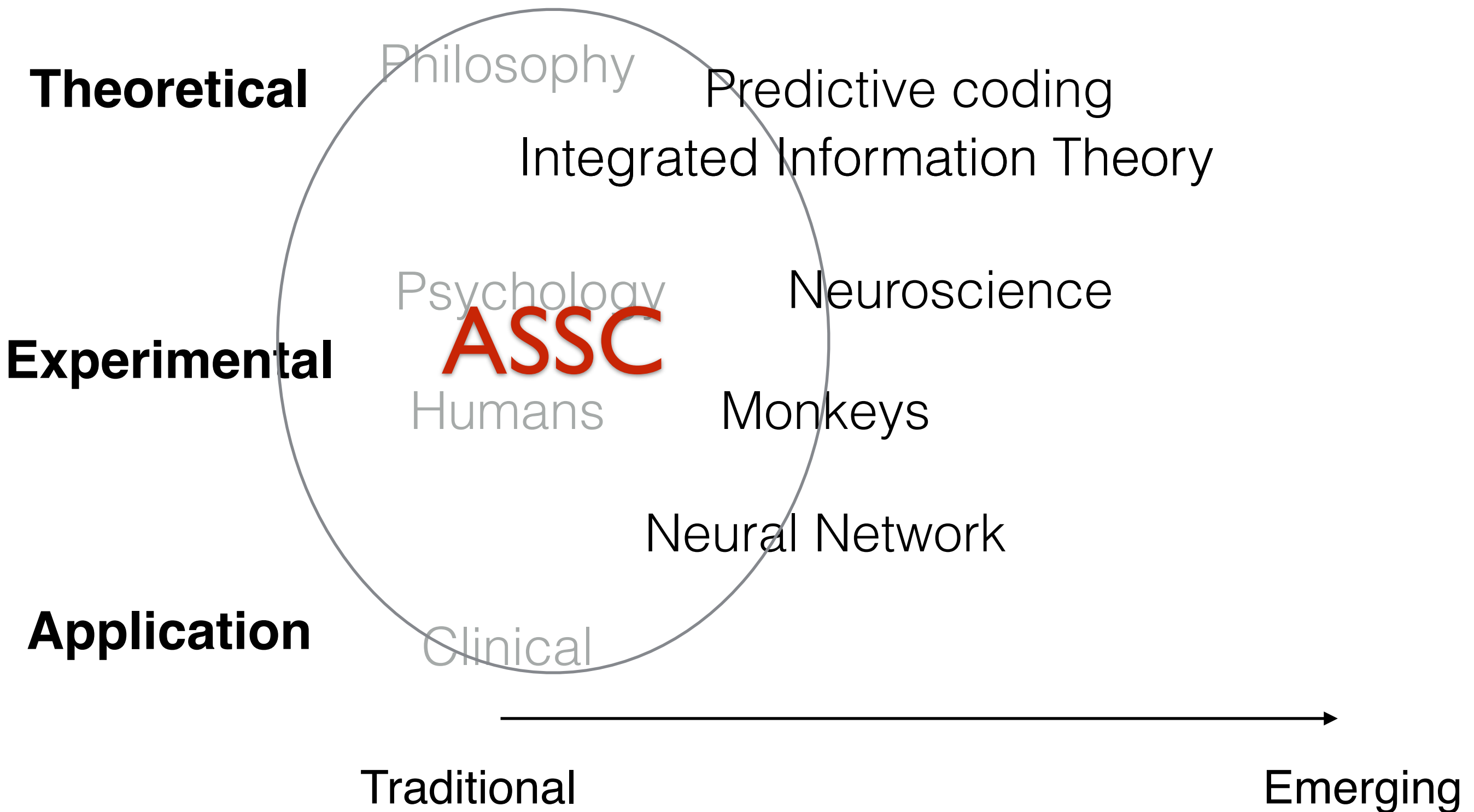
Clinical

Traditional

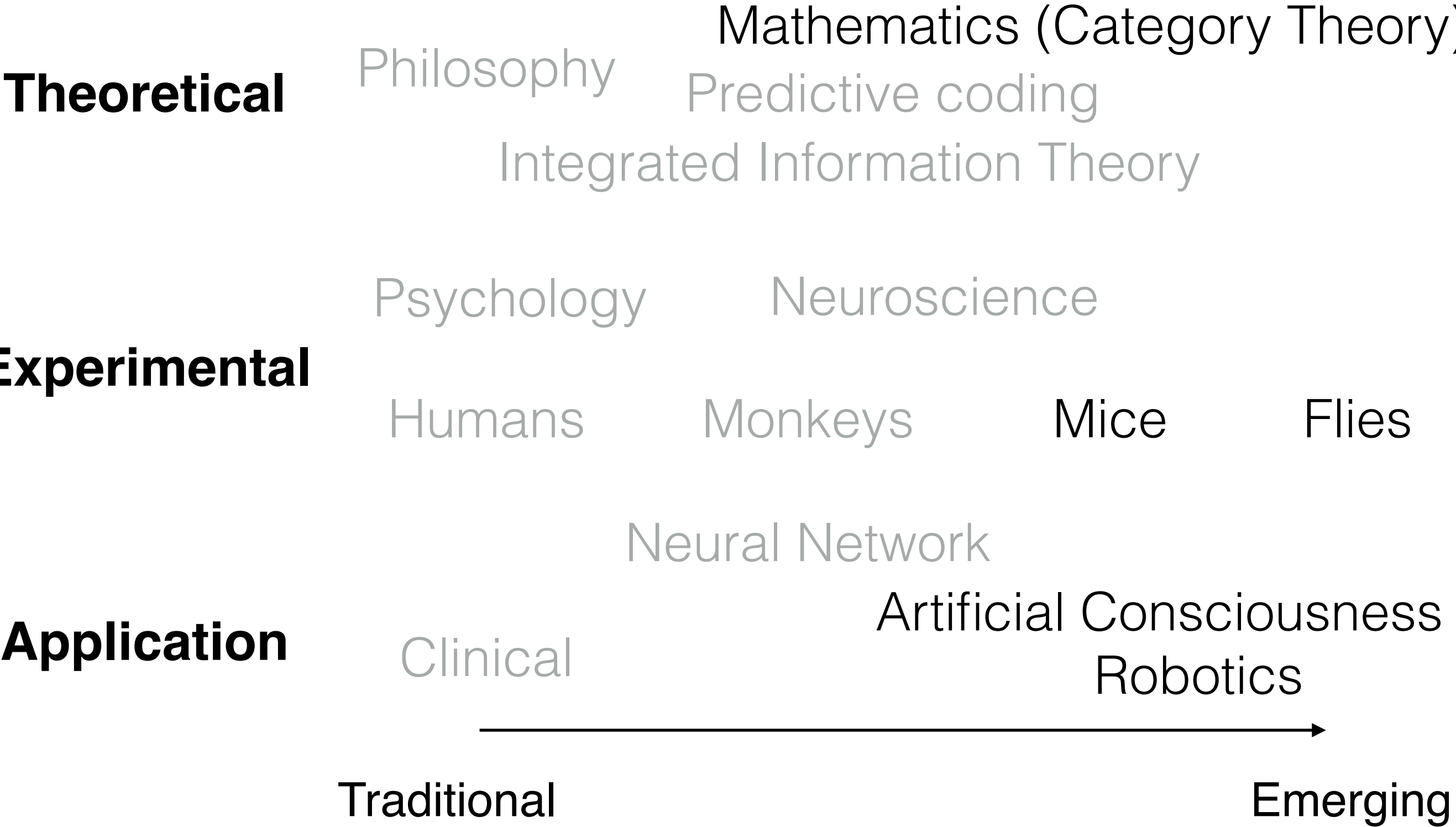
Emerging



A map of interdisciplinary studies of consciousness



A map of interdisciplinary studies of consciousness



One of the things that we learned through ISSA

- Important to clarify what you mean by “X”(not only “consciousness”). Formal definition is unnecessary, but common understanding is necessary.
- Information, causality, integration, model, representation, ...
- Prediction, attention, expectation, perception, cognition, ...
- Complexity, emergence, state, mechanism, ...

[good enough] definitions of “consciousness”

- **Level of consciousness** (as opposed to coma, anesthesia, dreamless sleep)
- **Contents of consciousness** (e.g., redness of red, pain, thoughts)
- **(Self consciousness)**

We can already discuss about this...

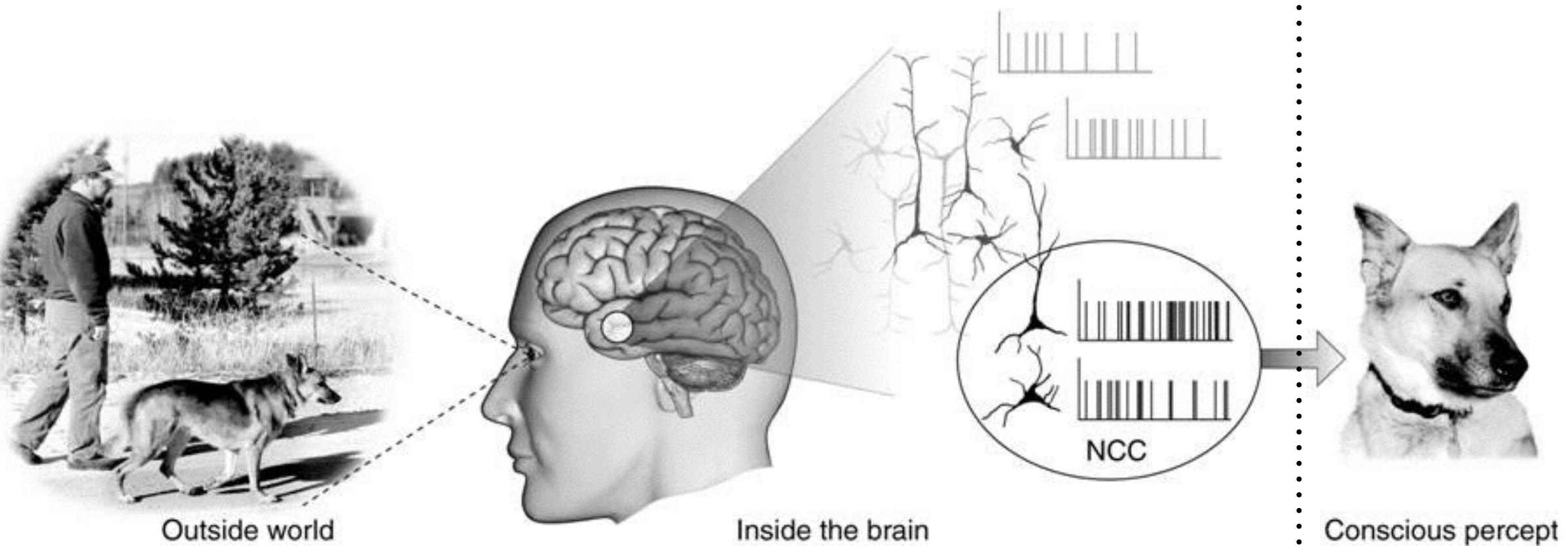
What is the Hard problem of
consciousness?

contents of consciousness

= qualia, conscious perception, conscious
thoughts, conscious feeling

physical
electromagnetic
chemical
interactions

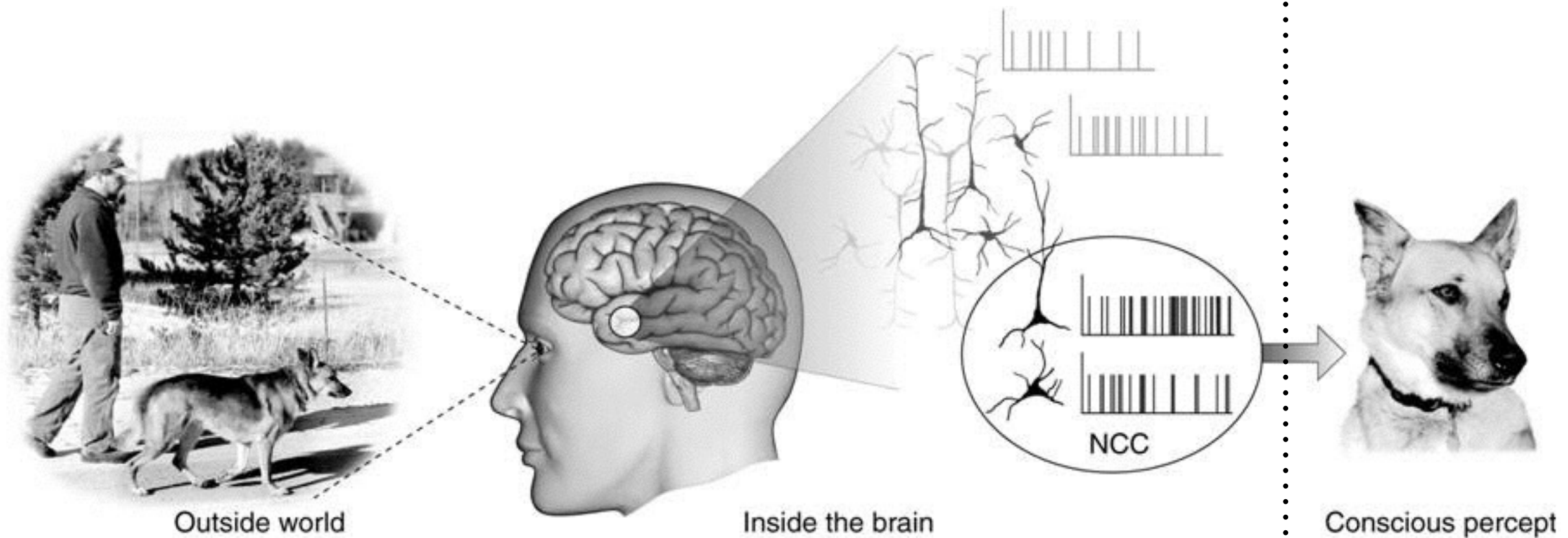
subjective
consciousness,
experience,
phenomenology



Example: Pain

physical
electromagnetic
chemical
interactions

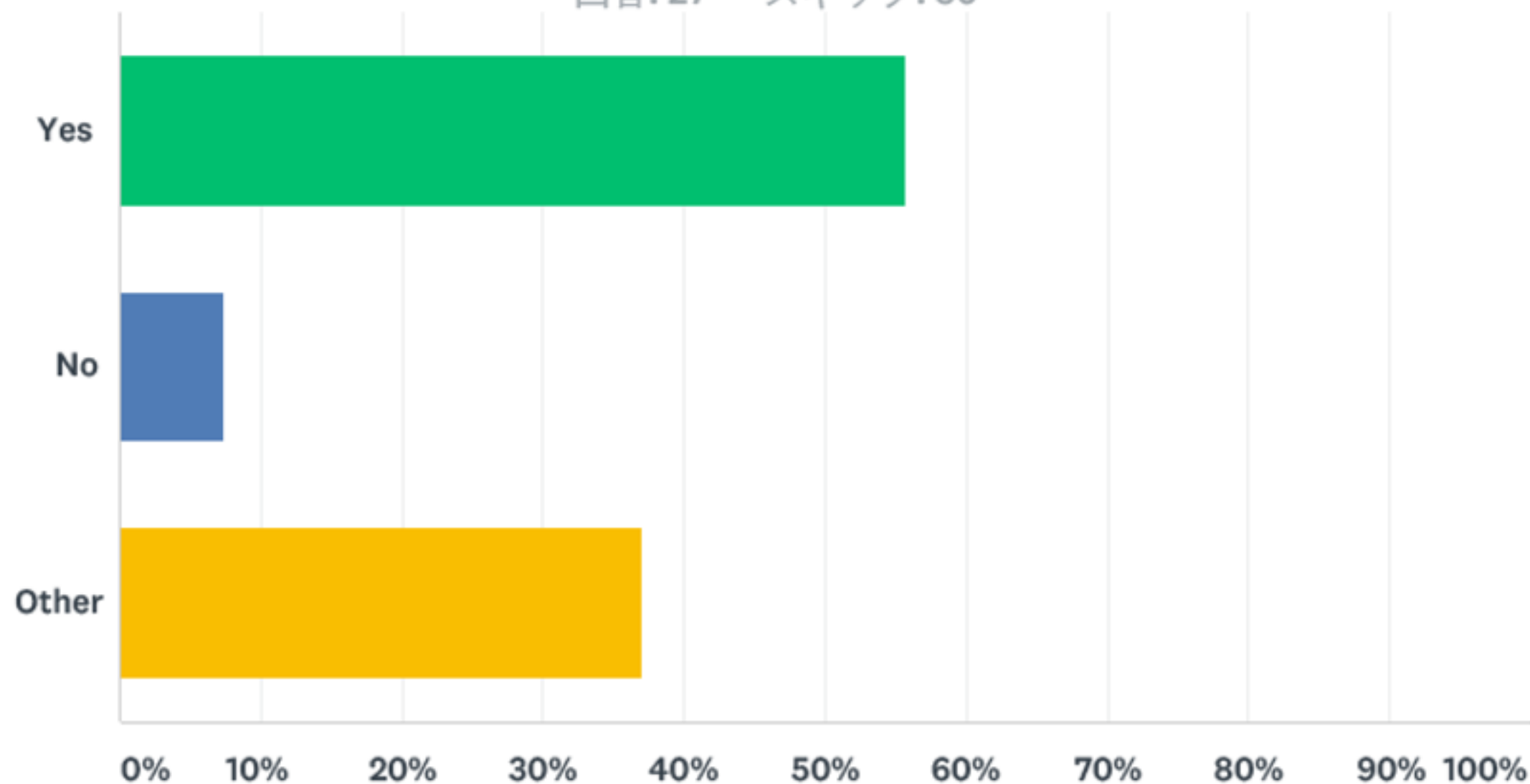
subjective
consciousness,
experience,
phenomenology



Hard Problem of consciousness

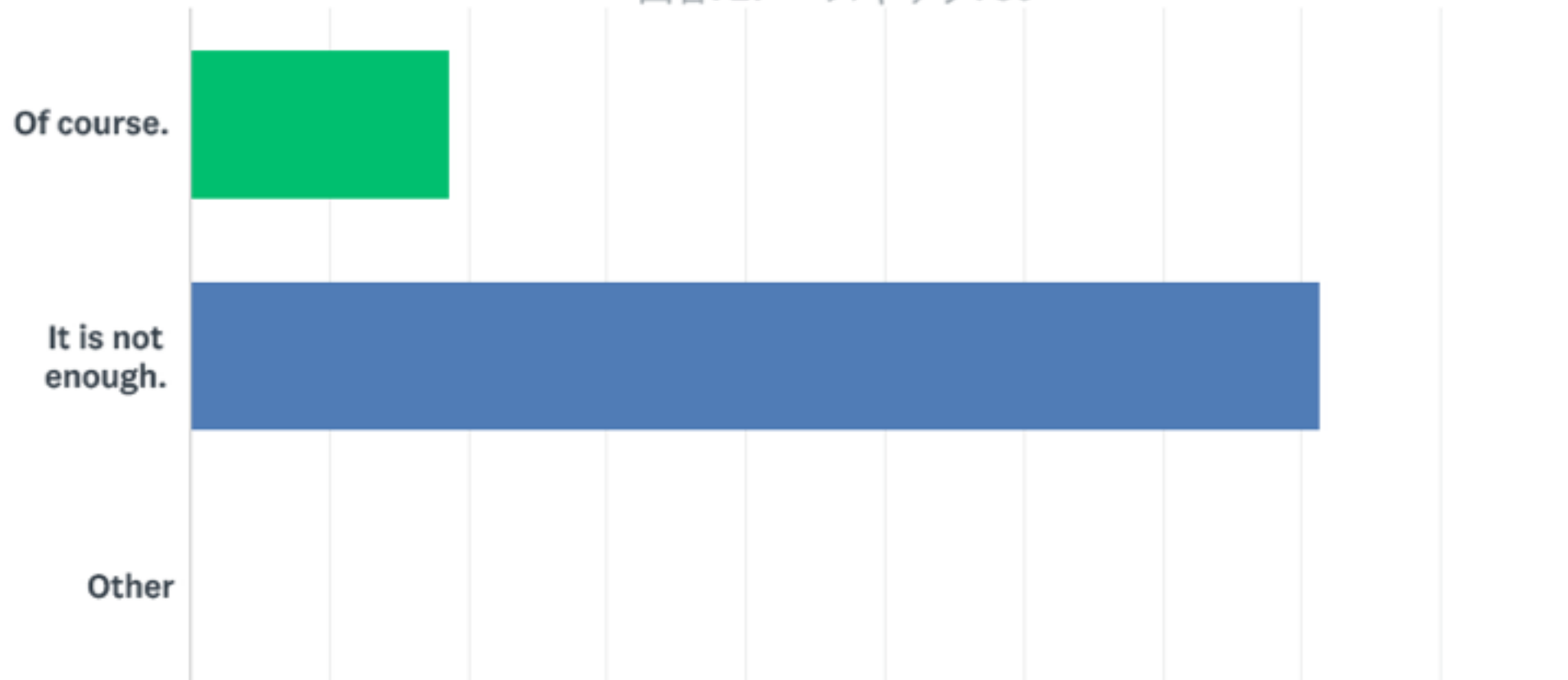
Q6) Can we solve Hard problem of consciousness?

回答: 27 スキップ: 30

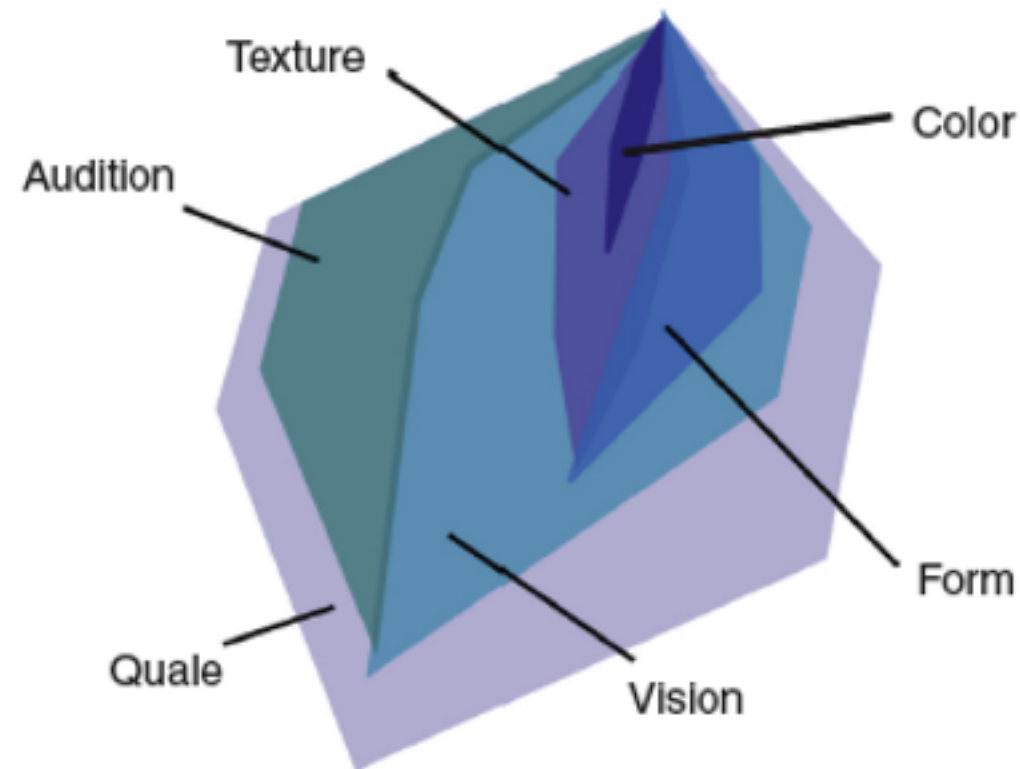


Q5) Can we understand consciousness only by studying the relationship between brain and consciousness?

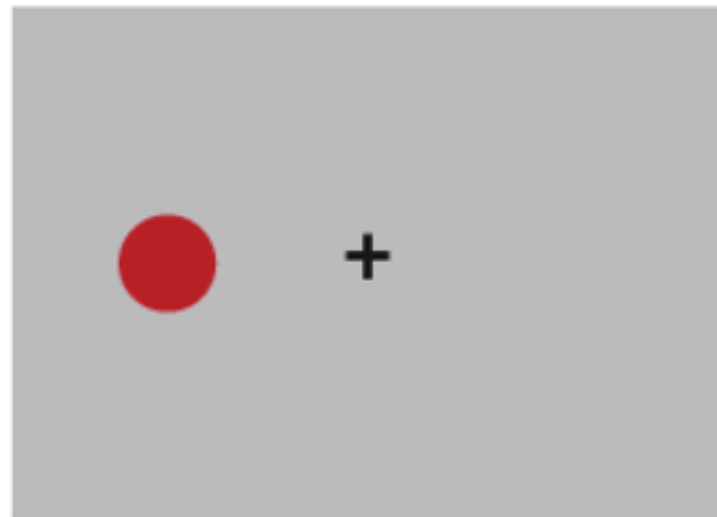
回答: 27 スキップ: 30



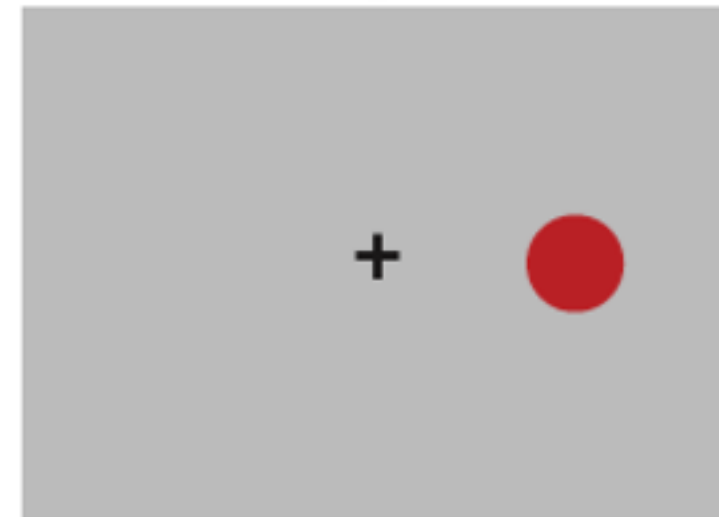
Broad- vs. Narrow- sense qualia



Red disk in left visual field



Red disk in right visual field



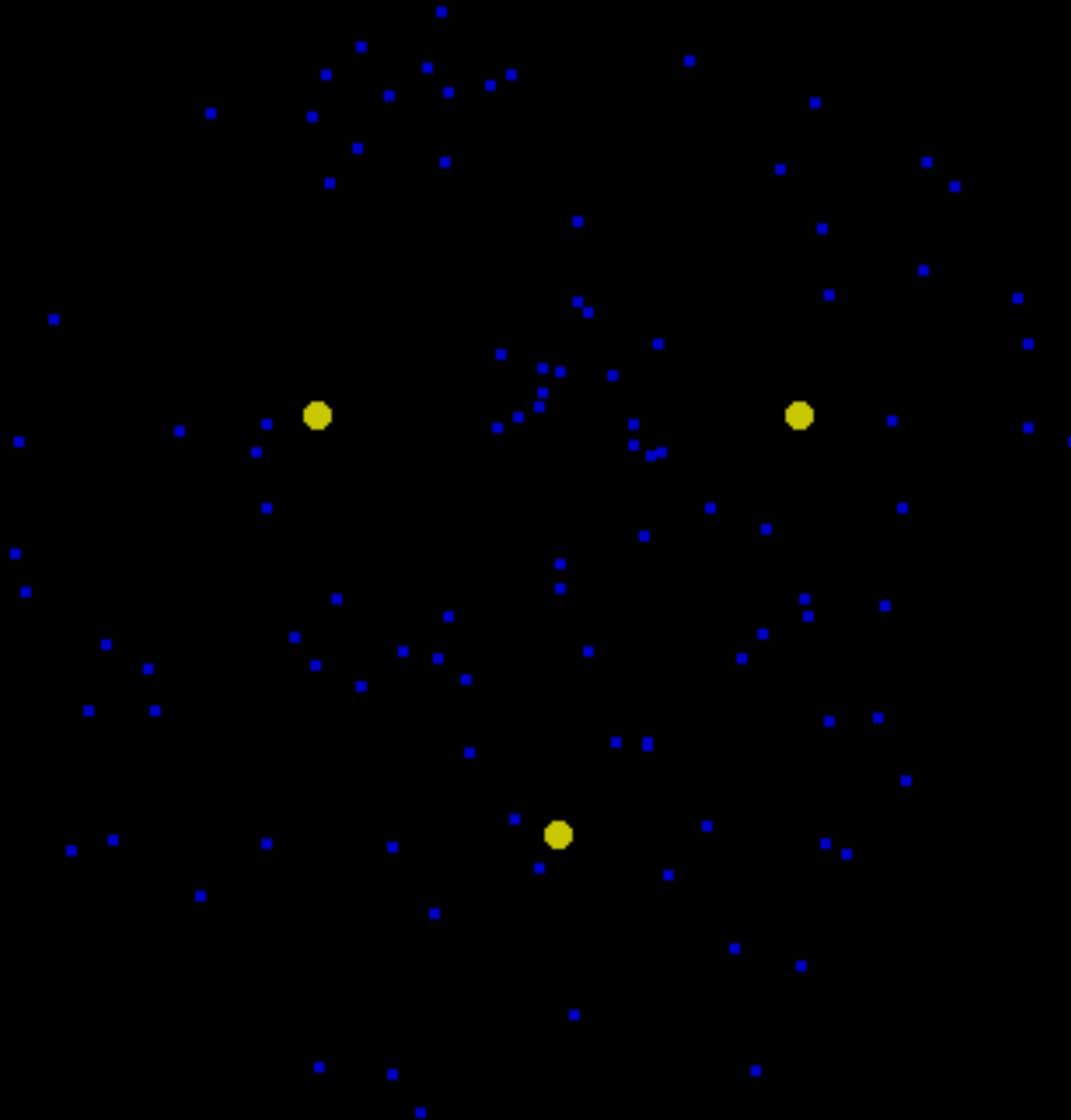
Broad sense: These two experiences are different qualia.

Narrow sense: The redness of the disks refers to the same quale.

What do I mean by
a quale of a yellow dot?

Motion-induced blindness

(Bonneh, Cooperman, Sagi 2001 Nature)



Why do we need *interdisciplinary* studies to understand consciousness?

- Everybody has an idea of
 - what consciousness is
 - what the theory of consciousness is like
 - what we can/should expect from studies of consciousness
- But these are often implicit (“Consciousness explained” by Daniel Dennett)

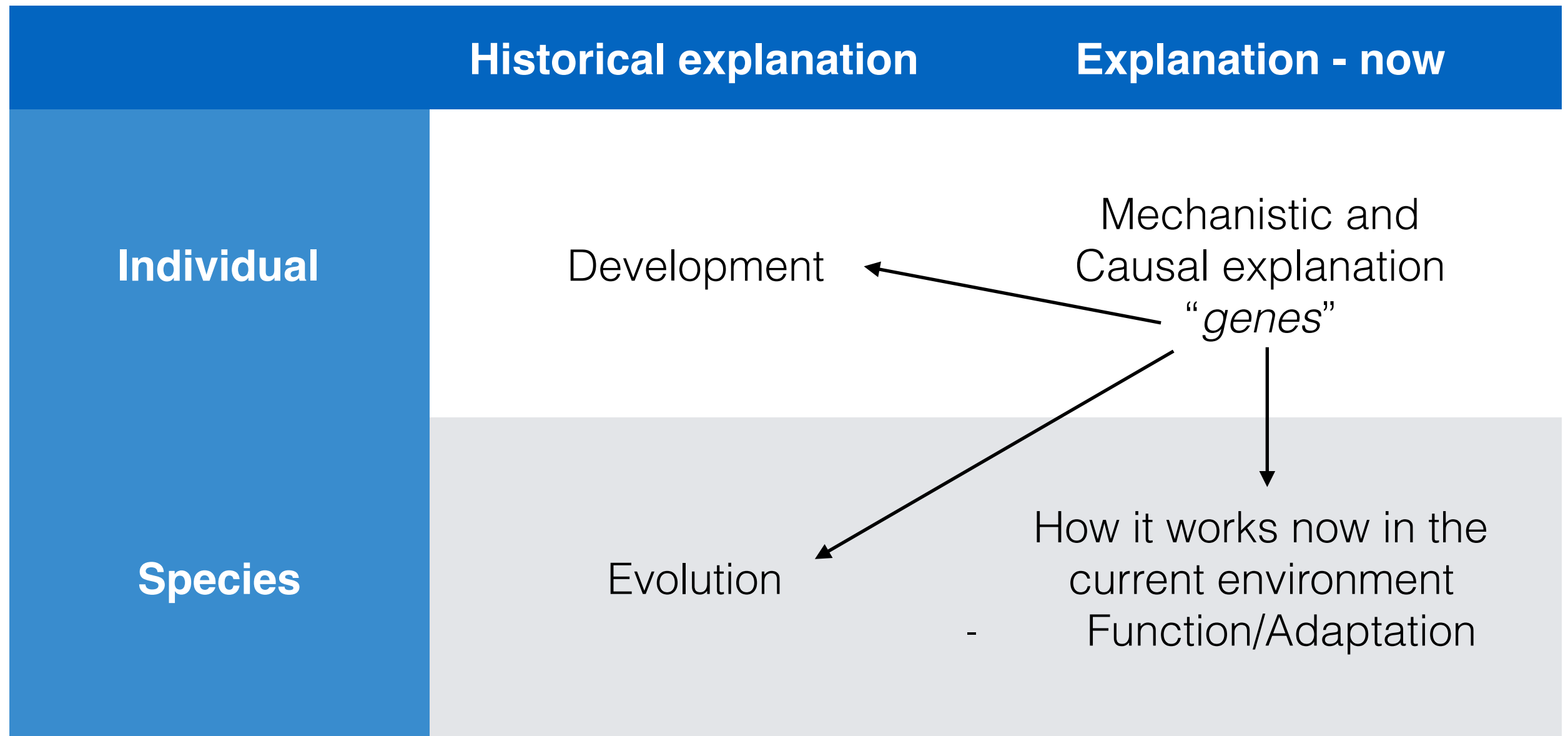
What people expect about what we mean by “explaining consciousness” - inspired by Tinbergen

	Historical explanation	Explanation - now
Individual	Development	Mechanistic and Causal explanation
Species	Evolution	How it works now in the current environment - Function/Adaptation

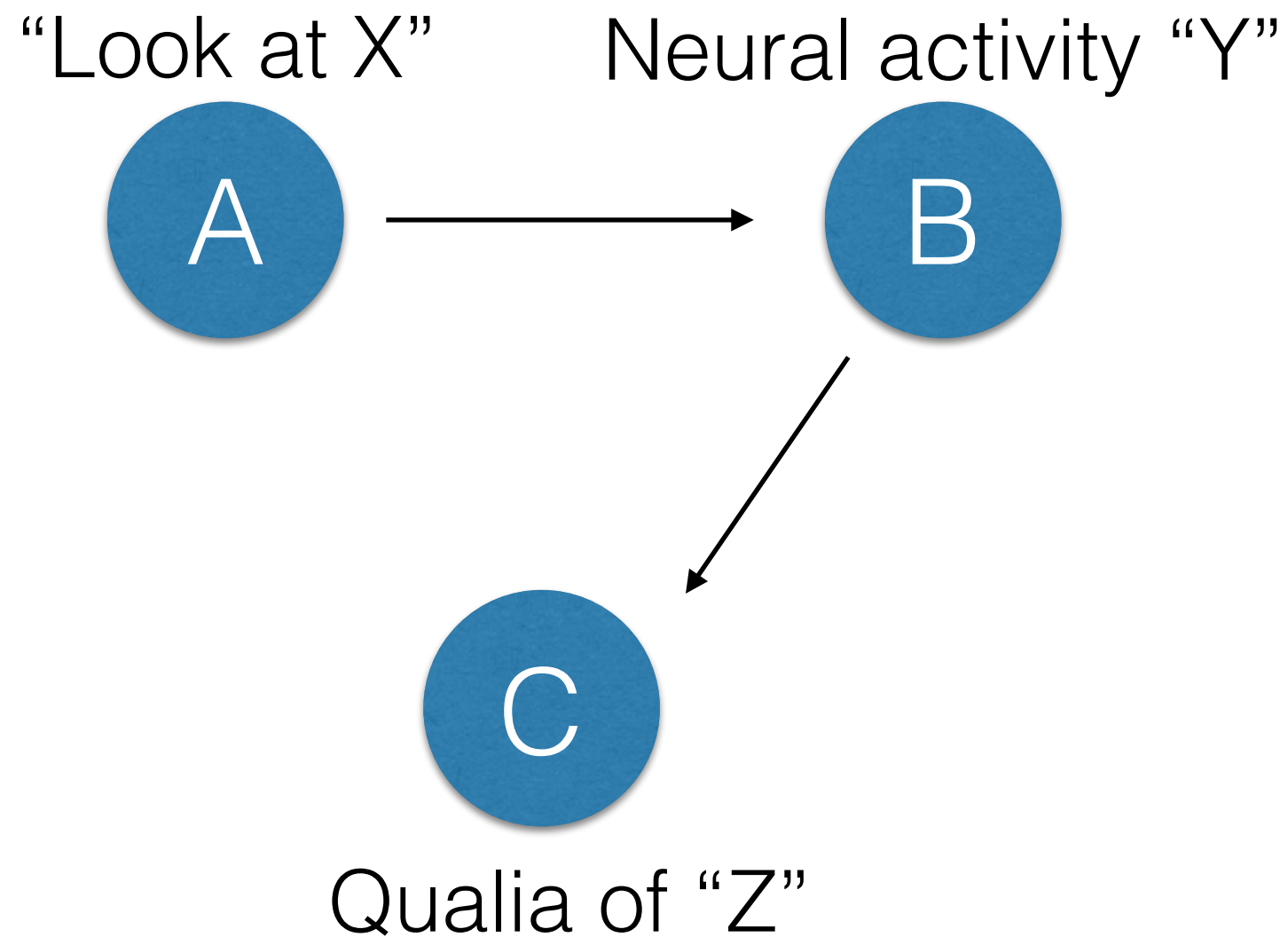
What people expect about what we mean by “explaining consciousness” - inspired by Tinbergen

	Historical explanation	Explanation - now
Individual	Development (PC) (Self/Body)	Mechanistic and Causal explanation (IIT)
Species	Evolution (PC) (Self/Language/Body)	How it works now in the current environment Function/Adaptation (PC) (Self/Language/Body) (Freewill)

Explanation of “life”

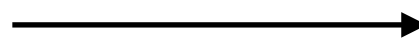


Causal explanation?

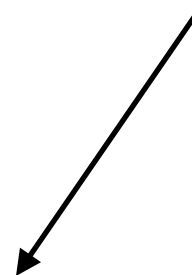


Causal explanation?

Dreaming
“Look at X2”
“Look at X”



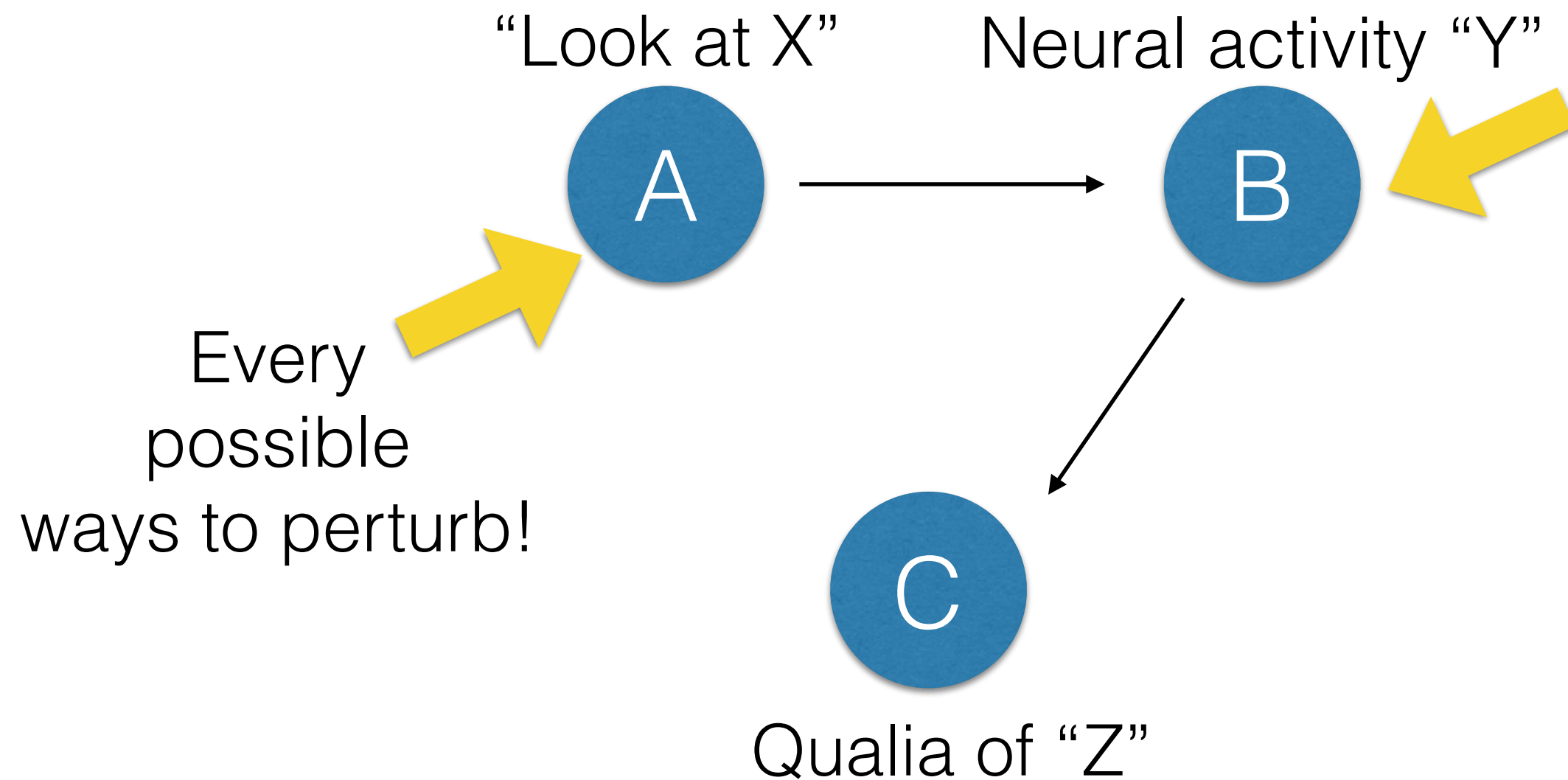
Neural activity “Y2”
Neural activity “Y1”
Neural activity “Y”



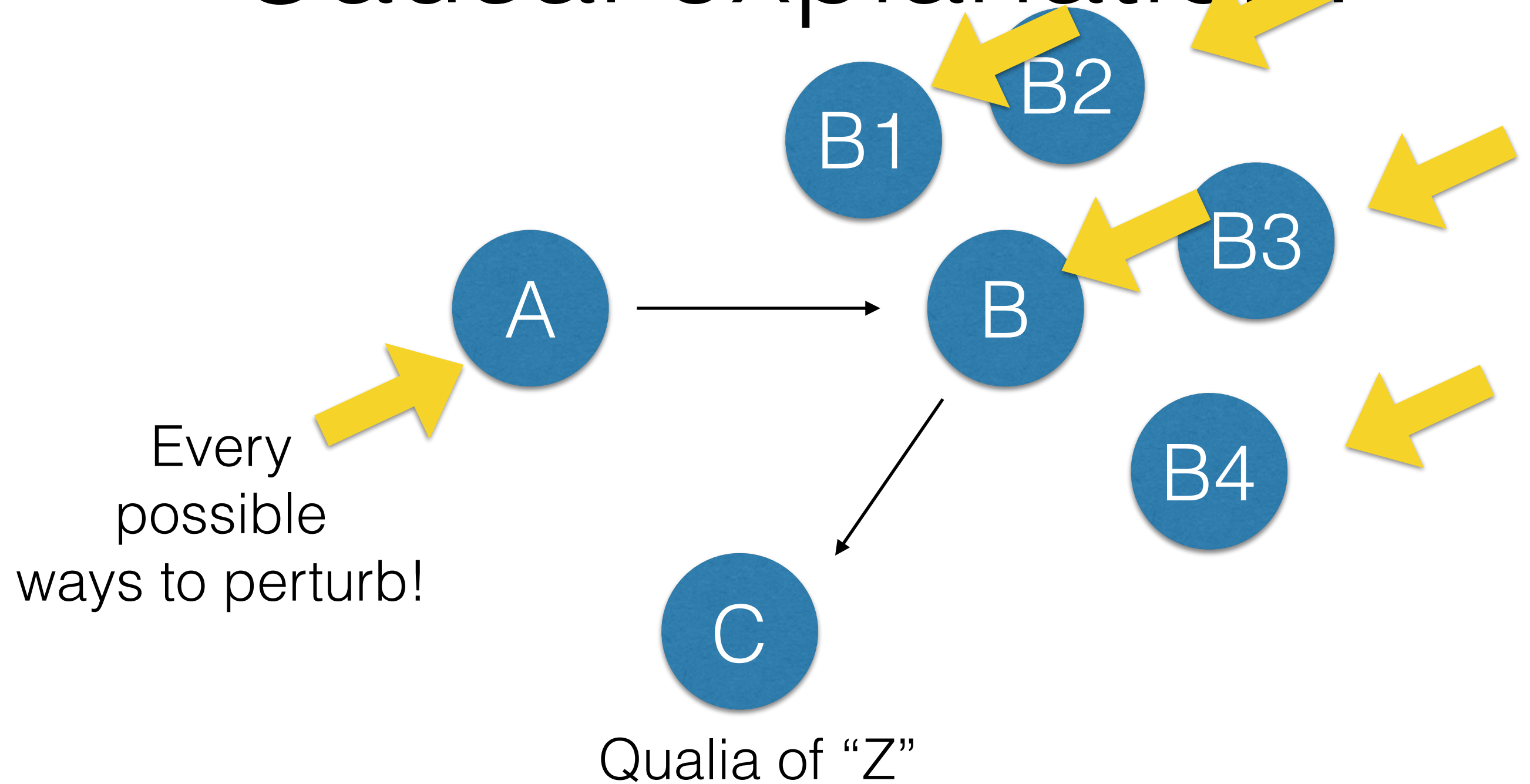
Qualia of “Z”
Qualia of “Z1”
Qualia of “Z2”

Can we infer causality
from lots of experimental
observations?

Causal explanation?



Causal explanation?



Wrapping up

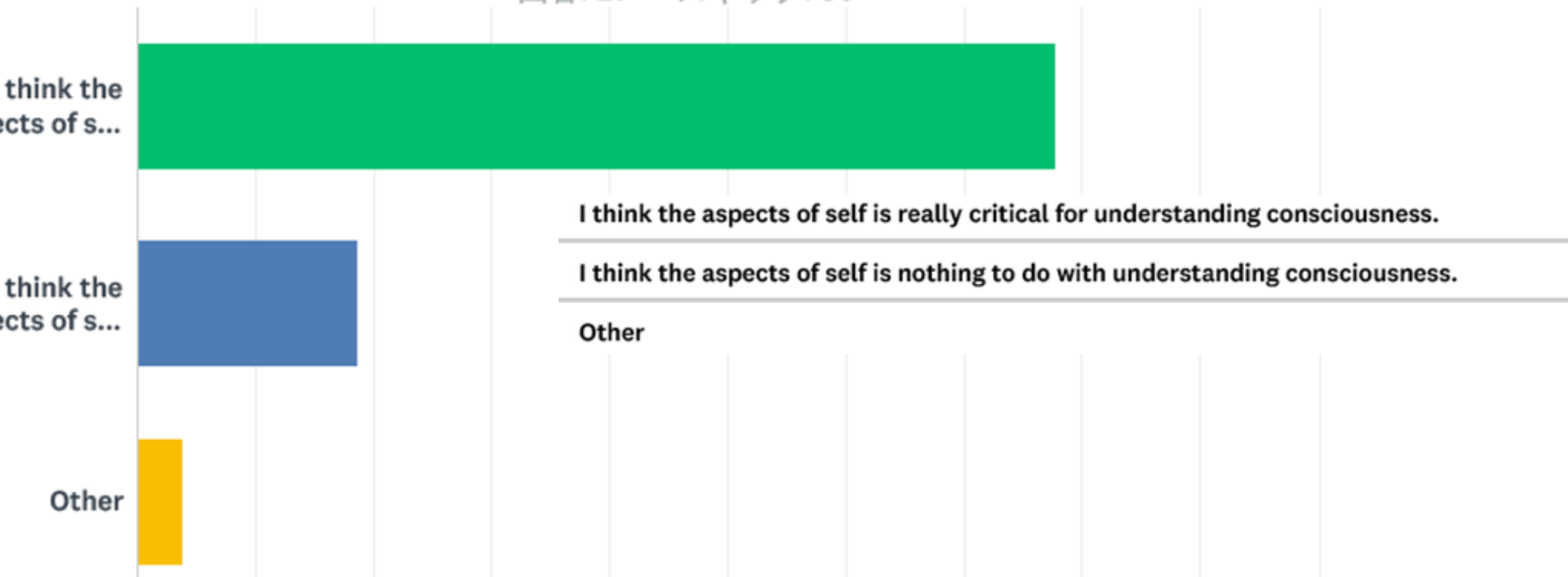
- Lots of non-neuroscientists
- And, we are more or less experts of their own consciousness
- NO assumption on the background knowledge in neuroscience.
 - Questions for clarification during talk welcomed
- Have fun!
 - No dirty words, no personal attacks
 - Focus on the debate in this room
 - Use laptops, iPads, phones etc outside

Survey results

Topic 3

Q2-1) What do you think about the role of self on consciousness?

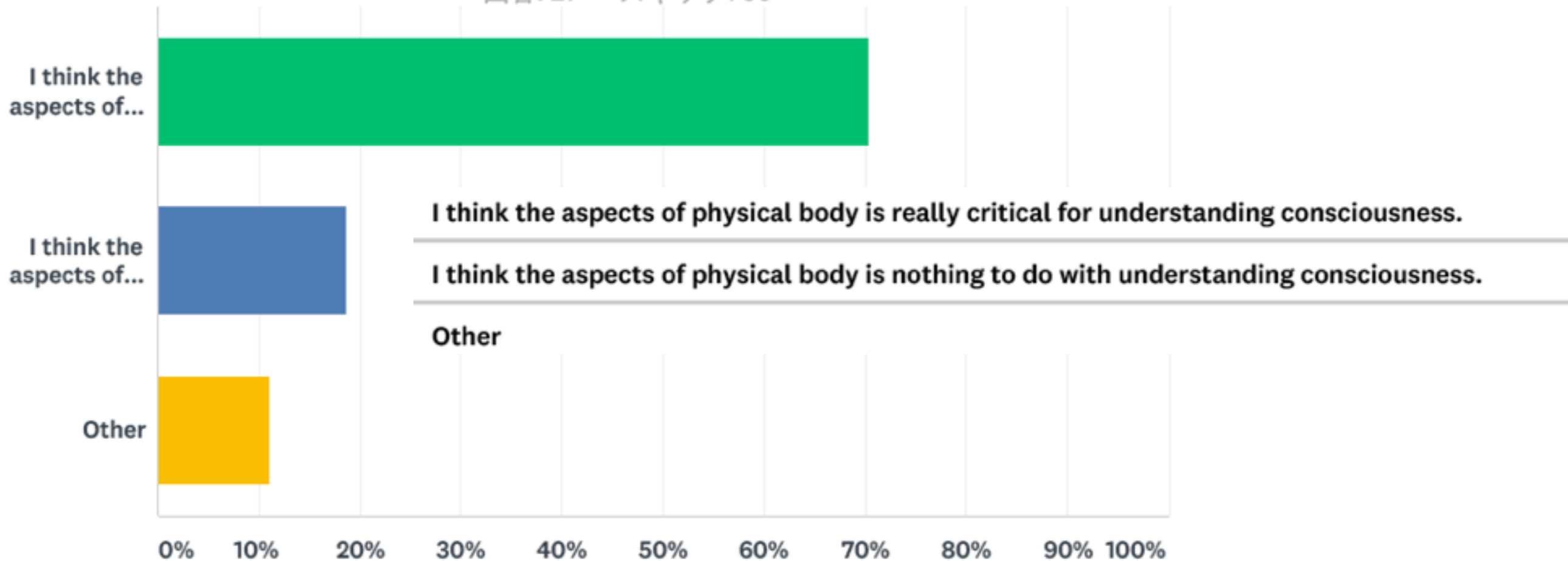
回答: 27 スキップ: 30



Topic 3

Q1-1) What do you think about the role of physical body on consciousness?

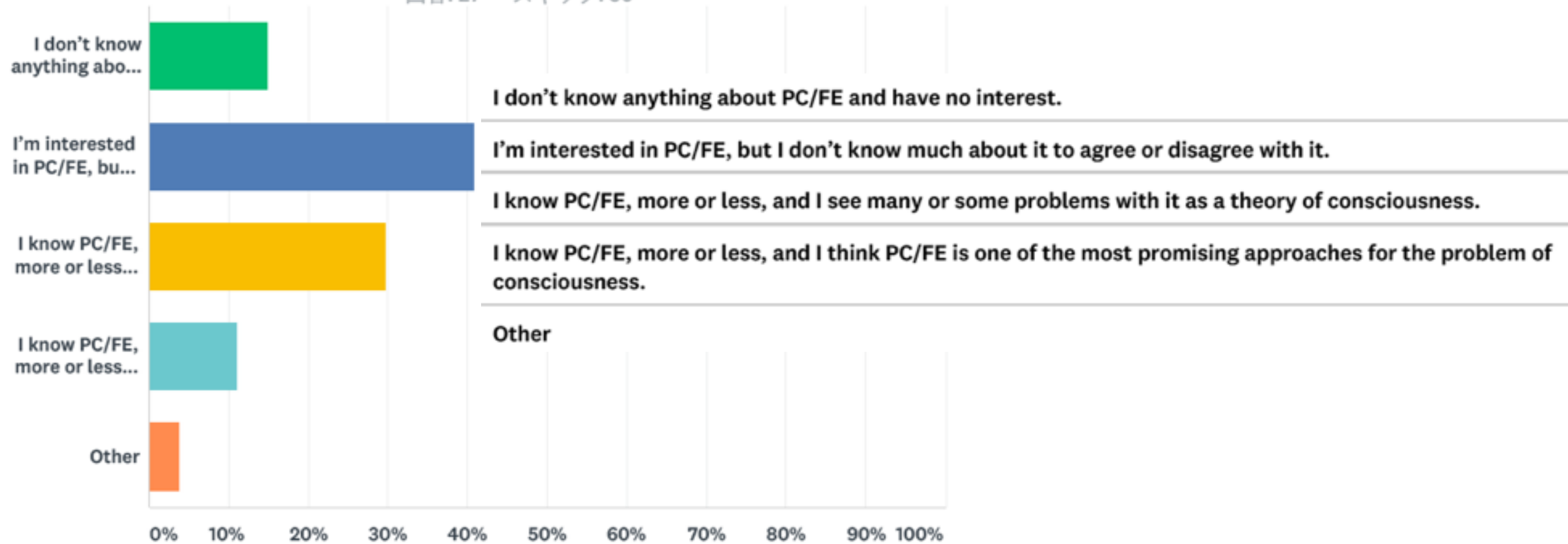
回答: 27 スキップ: 30



Topic 2

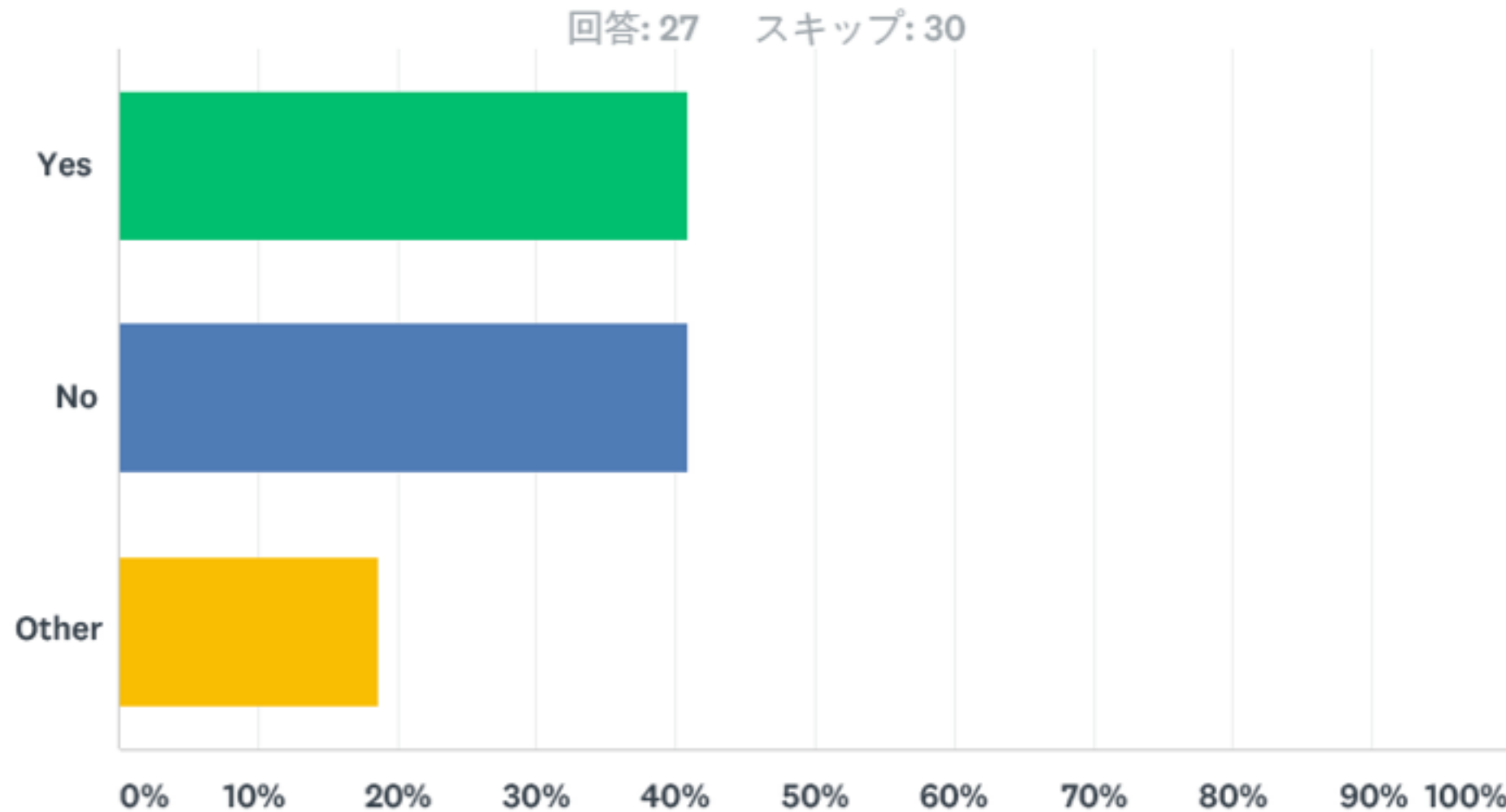
Q4-1) What do you think about the predictive coding (PC) or free energy (FE) account of consciousness?

回答: 27 スキップ: 30



related to Topic 2

Q8) Can we understand consciousness by studying neural representation of the world?



Topic 1

Q3-1) What do you think about Integrated Information Theory (IIT) of consciousness?

